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MBA PROFESSIONAL REPORT

Influences on the Retention of Residency-Trained and Non-Residency Trained Navy Dental Corps Officers

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By: Alan B. Christian
June 2004

Advisors: **Alice Crawford**
Bill Gates
Kathryn Kocher

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This research project identifies key influences on the retention of Navy Dental Officers beyond their post-obligation period. Two sample groups were selected. The first sample group was selected from Dental Officers who did not receive a Navy sponsored residency program and the second group from Dental Officers who completed a Navy sponsored residency program. Logistic regression models were developed for the Non-Residency and Residency sample data obtained from Bureau of Medicine and Surgery Manpower Information System. The results revealed that accession source, dental specialty and the number of operational tours as a percentage of total tours an officer completes during his or her obligation period were significant factors for retention of Dental Officers in the Non-Residency Model. Significant factors identified for the Residency Model were gender, age when first paid as a Navy Dentist, the number of years Dental Officers waited to begin a Navy-sponsored residency program and dental specialty. Dental Officers who receive their residency training between their sixth and eight year of service are more likely to remain on active duty more than one year beyond their obligated service commitment than officers beginning residency programs earlier or later in their careers.

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INFLUENCES ON THE RETENTION OF RESIDENCY-TRAINED AND NON-RESIDENCY TRAINED NAVY DENTAL CORPS OFFICERS

Alan B. Christian
Lieutenant, United States Navy Reserve
M.S., Saint. Joseph's University, 1998

Submitted in partial fulfillment of the
requirements for the degree of

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from the

NAVAL POSTGRADUATE SCHOOL
June 2004

Authors: _____
Alan B. Christian

Approved by: _____
Alice Crawford
Co-Project Advisor

_____
Bill Gates
Co-Project Advisor

_____
Kathryn Kocher
Co-Project Advisor

_____
Douglas A. Brook, Dean
Graduate School of Business and Public Policy

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ABSTRACT

This research project identifies key influences on the retention of Navy Dental Officers beyond their post-obligation period. Two sample groups were selected. The first sample group was selected from Dental Officers who did not receive a Navy sponsored residency program and the second group from Dental Officers who completed a Navy sponsored residency program. Logistic regression models were developed for the Non-Residency and Residency sample data obtained from Bureau of Medicine and Surgery Manpower Information System. The results revealed that accession source, dental specialty and the number of operational tours as a percentage of total tours an officer completes during his or her obligation period were significant factors for retention of Dental Officers in the Non-Residency Model. Significant factors identified for the Residency Model were gender, age when first paid as a Navy Dentist, the number of years Dental Officers waited to begin a Navy-sponsored residency program and dental specialty. Dental Officers who receive their residency training between their sixth and eight year of service are more likely to remain on active duty more than one year beyond their obligated service commitment than officers beginning residency programs earlier or later in their careers.

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EXECUTIVE SUMMARY

Today, the United States Navy Dental Corps (DC) is having difficulty retaining junior and mid-grade Dental Corps Officers. Many Dental Officers are not remaining on active duty beyond their initial or post-residency obligation requirements due to economic and Navy specific reason. Additionally, the Navy failed to meet the recruitment goal in fiscal year 2002 for Dentists. The combination of these events has the potential to reduce both current manning levels and future leadership.

This research project identifies key influences on the retention of junior Navy Dental Officers beyond their post-obligation period, the factors that influence more senior Dental Officers who have completed a residency program to remain on active duty beyond the obligation incurred as a result of residency training, and how timing of residency training in a Dental Officer's career affects the likelihood of staying past his or her obligation.

Two sample groups were selected for this study. The first sample group was selected from Dental Officers who did not receive a Navy sponsored residency program and the second group from Dental Officers who completed a Navy sponsored residency program. Logistic regression models were developed for the Non-Residency and Residency sample data obtained from Bureau of Medicine and Surgery Manpower Information System.

The results of the study revealed that accession source, dental specialty and the number of operational tours as a percentage of total tours an officer completes during his or her obligation period were significant factors for retention of Dental Officers in the Non-Residency Model. Significant factors identified for the Residency Model were gender, age when first paid as a Navy Dentist, the number of years Dental Officers waited to begin a Navy-sponsored residency program and dental specialty. Dental Officers who receive their residency training between their sixth and eight year of service are more likely to remain on active duty more than one year beyond their obligated service commitment than officers beginning residency programs earlier or later in their careers.

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I. INTRODUCTION AND BACKGROUND

A. INTRODUCTION

Today, the United States Navy is facing a period of record retention among both officers and enlisted personnel by meeting its recruiting goal through 2003.[1] Unfortunately, the Dental Corps (DC) is having difficulty retaining junior Dental Corps Officers beyond their initial obligation requirements and failed to meet their recruitment goal in fiscal year 2002.[2] Although Dental Corps Officers are accepting Navy-sponsored and funded graduate education and residency training, many junior officers are leaving active duty as soon as their obligated payback period has been completed. This group of junior officers is required to fill many operational billets both at sea and in support of the United States Marine Corps and is critical to meeting the DC mission to maintain the dental readiness of today's Sailors and Marines. Numerous reasons have been suggested for the decline in junior Dental Corps Officers retention. Among these suggested causes are competition from the civilian sector of the economy, military pay structure, dental school debt and military service operational commitments.[3]

1. Project Scope

Dental Officers and dental school graduates have numerous employment choices. Both are looking to maximize their earning potential to financially overcome the increasing cost of dental school and its associated dental school loan debt, or to purchase and operate a private practice in the civilian sector.[4] Changes in the economy have led to an increasing gap between civilian and military dentists' professional compensation.

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[1] Chief of Naval Operations, "Top Five Priorities; Status Report on CNO Guidance for 2003," 2003, http://www.chinfo.navy.mil/navpalib/cno/cno-top5-report2004.html/ [11 May 2004].

[2] Jones, Scott M.,<SCMJones@US.MED.NAVY.MIL> "Dental Corps: Forces Structure Statistics Fy03-2nd Quarter [Power Point Attachment]," [E-mail to Alan Christian <abchrist@nps.navy.mil>] 27 April 2004.

[3] Ibid.

[4] M. Almendarez, S. Brannman, C. Rattelman, and E. Scherer, Center for Naval Analyses, Health Professions' Retention-Accession Incentives Study Reported to Congress, CRM D0003360.A1, (Alexandria, Virginia: 2001), 34-36.

Furthermore, military commitments and the increasing cost of dental school education have contributed to a decrease in the retention of junior and mid-grade Dental Officers in the Navy.[5]

This project studies the relationships of key variables that influence the retention of Navy Dental Officers beyond their initial obligation period or beyond their obligated service commitment incurred for receiving a Navy-sponsored residency program. The primary proposed research questions are the following:

- What are the factors that influence junior Dental Officers in their decisions to remain on active duty beyond their initial period of obligation?
- What factors influence more senior Dental Officers who have completed a residency program to remain on active duty beyond the obligation incurred as a result of residency training?
- In particular, how does the timing of residency training in a Dental Officer's career affect the likelihood of staying past his or her obligation?

This research was initiated and sponsored by the Bureau of Medicine and Surgery (BUMED), Dental Corps Directorate (M09B DC). All personnel retention data used in support of the research project were obtained from a BUMED database.

B. BACKGROUND

1. Dental Corps History

Although one of the youngest of Navy Medicine's Corps, the United States Dental Corps can trace its roots back to 1873.[6] Prior to the establishment of the Dental Corps, dental services were performed by civilian dentists ashore and Medical Corps or Corpsmen afloat, but the groundwork was laid for the initiation of the modern Dental Corps. It was not until 1912 that Congress officially authorized the establishment of the precursor to the modern-day Dental Corps.[7] Although only composed of 30 "acting assistant dental surgeons"[8] the newly established Dental Corps' impact was quickly

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[5] Jones, Scott M.,<SCMJones@US.MED.NAVY.MIL> "Dental Corps: Forces Structure Statistics Fy03-2nd Quarter [Power Point Attachment]," [E-mail to Alan Christian <abchrist@nps.navy.mil>] 27 April 2004.

[6] [6] "90 Years Marching Forward." Lkd. Dental Corps History at "Naval Medicine Online Webpage." http://navalmedicine.med.navy.mil/default.cfm?seltab=about&selmod=7AF79F11-2A5E-780B-45D6C0D83FF101C8&docid=10307&parentid=942CA57C-802E-D019-A46C463C916A02D3& [11 May 2004].

[7] Ibid.

[8] Ibid.

revealed. Within one year of service, the Navy Surgeon General was able to report to the Secretary of the Navy that recruitment was directly improved due to the establishment of the Dental Corps. Navy dentists were able to treat dental conditions that only a year prior would have rendered a recruit unfit for active duty. [9]

World War One solidified the importance of the Navy DC. The meager 30 officers grew to more than 500, serving on ships, at shore commands and forward deployed with the United States Marine Corps.[10] Today, the Dental Corps continues its tradition by ensuring the military readiness of today's Sailors and Marines by proudly serving on 120 naval ships and attached to Marine Expeditionary Units. These officers now perform many critical support functions for the medical community, serving as Triage Officers and Surgical Support Officers.[11] Additionally, many subspecialty dentists serve not only on large deck platforms but also around the world.

2. Dental Corps Structure and Composition

The United States Navy Dental Corps is one of five Corps under the Chief, Bureau of Medicine and Surgery. The Chief of the Navy Dental Corps serves as the Assistant Chief for Dentistry for the Bureau of Medicine and Surgery (M09B DC) and reports to the Deputy Chief, Bureau of Medicine and Surgery.[12] As a Rear Admiral Upper Half, he or she is responsible for dental readiness of the fleet and Marine Corps, planning and operations, material and facilities and healthcare analysis.[13] The Dental Corps headquarters is located in Washington, D.C. at the Bureau of Medicine and Surgery.

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[9] "90 Years Marching Forward." Lkd. Dental Corps History at "Naval Medicine Online Webpage." http://navalmedicine.med.navy.mil/default.cfm?seltab=about&selmod=7AF79F11-2A5E-780B-45D6C0D83FF101C8&docid=10307&parentid=942CA57C-802E-D019-A46C463C916A02D3& [11 May 2004].

[10] Ibid.

[11] Ibid

[12] Navy Department, Manual of the Medical Department, NAVMED P-117 (Washington, DC:1996), Chapter 6, 5.

[13] Ibid, 3-6.

In February 2004, the Dental Corps had 1,226 officers on active duty and 1,368 billeted positions around the world and forward deployed on Naval vessels.[14] The critical issue facing the Dental Corps today is retention of junior officers. Table 1 reveals the current billet structure, which demonstrates the need for junior officers who represent approximately 64 percent of the Corps. Additionally, the senior billet structure requires a significant number of junior officers to be promoted or retained to sustain manning levels at the Commander and Captain ranks (Table 1).

Table 1. Number of Dental Corps Billets By Pay Grade

Pay Grade	Rank	Billet Count	Percentage of Total
8	Rear Admiral (Upper)	1	0.07
7	Rear Admiral (Lower)	1	0.07
6	Captain	263	19.23
5	Commander	226	16.52
4	Lieutenant Commander	355	25.95
3	Lieutenant	522	38.16
Total		1368	100.00

Source: Bureau of Medicine and Surgery (M09B)

3. Dental Corps Officer Accession Programs

The Dental Corps faces increasing competition from the civilian sector. With a steady economy, the promise of higher civilian initial salaries without the commitment of active duty service is suspected of luring potential candidates away from commissioning programs or causing them to resign their commissioning after their initial obligated service requirement has been completed. Many future dentists use one of numerous commissioning programs to obtain their dental education. These programs are specified by Office of the Chief of Naval Operation (OPNAV). The definitions of these programs

[14] Jones, Scott M.,<SCMJones@US.MED.NAVY.MIL> "Dental Corps: Forces Structure Statistics Fy03-2nd Quarter [Power Point Attachment]," [E-mail to Alan Christian <abchrist@nps.navy.mil>] 27 April 2004.

are taken directly from the OPNAV instruction (OPNAVINST 1110.1) and are listed below:[15]

- Direct Commission: Recruiting a Dentist directly from a civilian environment.
- Recall to Active Duty: The voluntary return of a commissioned officer from the Reserves to active duty.
- Inter-service Transfer: The transfer of a commissioned officer serving on active duty, between uniformed services, or the transfer of commissioned officers not on active duty, between reserve components of the uniformed services.
- Health Service Collegiate Program (HSCP): Two-year scholarship program in designated health professions to complete degree/certification requirements and obtain Reserve officer commission in the active duty component of the Dental Corps upon graduation.
- Armed Forces Health Professions Scholarship Program (AFHPSP): Scholarship program for attendance at the Uniformed Service University of the Health Science (USUHS). This program requires a minimum two-year payback and six months of service for each additional six months of education.[16]
- Health Professions Scholarship Program (HPSP): An Inactive Ready Reserve Program for students accepted to, or enrolled in an accredited training program leading to a health profession degree. This program also allows HPSP graduates to obtain graduate professional education at accredited civilian institutions.[17]
- Financial Assistance Program (FAP): An Inactive Ready Reserve Program for dentists currently accepted to, or enrolled in an accredited residency or fellowship program progressing toward a specialty, which has been designated as critical to Department of Defense (DoD).[18]
- Health Professions Loan Repayment Program (HPLRP): An active duty and Reserve program used to recruit qualified health professionals in specific specialties. Under the HPLRP, the Navy repays all or a portion of the participants' incurred educational loan obligations.[19]

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[15] Navy Department, Administration of Health Professional Accession Programs (HPAP), OPNAVINST 1110.1 (Washington, DC: 2001), 2-3.

[16] Navy Department, Armed Forces Health Professions Scholarship Program (AFHPSP), SECNAVINST 1520.8A CH-1 (Washington, DC: 1989), 2-4.

[17] Navy Department, Administration of Health Professional Accession Programs (HPAP), OPNAVINST 1110.1 (Washington, DC: 2001), 2-3.

[18] Ibid, 2-3.

[19] Ibid, 2-3.

Individuals who participate in a Navy sponsored dental educational scholarship program, including AFHPSP, HPSP, HSCP and FAP, are commissioned as Ensigns in the Reserves while under educational instruction. These individuals retain this rank and corresponding pay-grade salary while functioning as a "prospective Dental Corps officer."[20] While in dental school under a Health Profession Scholarship Program, these individuals receive monthly stipends, full tuition and reimbursement for books and associated expenses.[21] Additionally, the total service obligation is three years for individuals accepting any of the above accession programs in which the U.S. Navy funds or provides a "program of professional study in dentistry leading to a Doctor of Dental Surgery (DDS) or Doctor of Dental Medicine (DMD)."[22]

4. Military Pay Structure

Although not directly addressed in this research study, DC Officers' compensation has long been suggested as a significant contributor to poor retention for junior and mid-grade officers.[23] Numerous studies have investigated differences in the compensation of military healthcare professionals and their civilian counter parts. Findings reveal that for both military physicians and dentists, there are pay gaps between military providers and their civilian counter parts throughout their careers (Figure 1).[24] These pay gaps are considered a leading contributor to poor officer retention.[25]

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20 Navy Department, Appointment of Regular and Reserve Officers in the Dental Corps of the U.S. Navy, SECNAVINST 1120.13A Enclosure 1 (Washington, DC: 1988) 1.

21 "So, You Want The Navy To Pay For Your Med School," GruntDoc, 22 April 2004. <http://www.gruntdoc.com/archives/000541.html/> [11 May 2004].

22 Ibid.

23 David Taylor, Center For Naval Analyses, Comparison of Civilian and Navy Pay for Dentists, CRM 91-20, (Alexandria, Virginia: 1991), 1.

24 M. Almendarez, S. Brannman, C. Rattelman, and E. Scherer, Center for Naval Analyses, Health Professions' Retention-Accession Incentives Study Reported to Congress, CRM D0003360.A1, (Alexandria, Virginia: 2001), 35, 73.

25 D. S. Nice and S. M. Hilton, Naval Health Research Center (1991). U.S. Navy Dental Corps Officer Survey: Perceptions, Attitudes, and Turnover Intent, ADA 242150, (San Diego, California: 1991), 21.

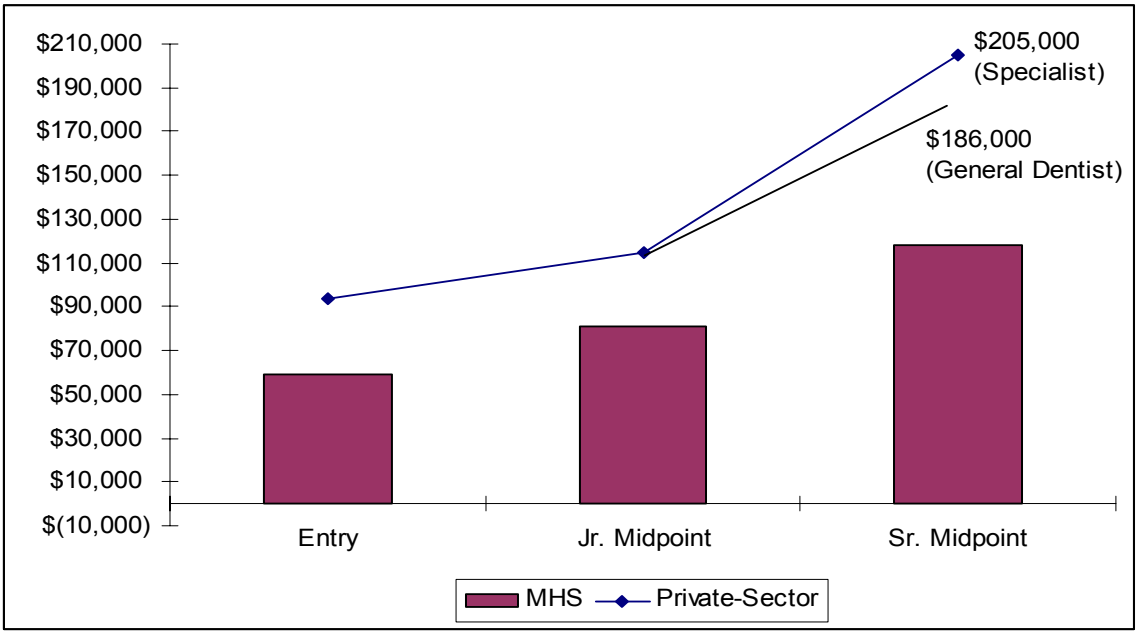

Figure 1. Comparison of Navy Dental Officers Compensation v. Private-Sector Dentists in 2000.
After Ref: M. Almendarez, S. Brannman, C. Rattelman, and E. Scherer, Pg. 35.

To alleviate this pay gap and perception, numerous pay incentive programs have been instituted to decrease the pay gap between the military pay schedule and average salaries for equivalent civilian jobs. Today's Dental Officers receive numerous incentives with varying levels of compensation based on years of service, specialty area and contractual commitment to the Navy. Navy Dental Officers now have access to Variable Special Pay (VSP), Additional Special Pay (ASP), Board Certification Pay (BCP), Dental Officer Multiyear Retention Bonus (DOMRB) and, recently, a one time Critical Skills Retention Bonus (CSRB) in addition to the officer's regular military pay. Furthermore, new accessions who agree to serve on active duty and did not receive DoD financial aid, or were not participants in the Armed Forces Health Profession Scholarship Program (AFHPSP) and Financial Assistance Program (FAP) to pay for dental school, are eligible for an accession bonus for joining the Navy.[26] The currently approved categories of special pay and their explanations are:

[26] Department of Defense, Financial Management Regulation Military Pay Policy and Procedures – Active Duty and Reserve Pay, DoDFMR 7000-14R, Volume 7A, Chapter 6 (Washington, DC: 2002), 3.

1. Variable Special Pay: VSP is an annual entitlement for DC officers on active duty who will serve for at least one year unless qualifying under specific provisions outlined in the Chapter Six of the DoD Financial Management Regulations. VSP is disbursed monthly and the payment amount is adjusted based on years of service and the completion of an initial residency program (Table 2).[27] This entitlement does not have a contractual obligation beyond the eligibility requirement of one year.[28]

Table 2. Dental Corps Variable Special Pay

Variable Special Pay (VSP)	
Years Serivce	**Special Pay Amount (Dollars)**
<3 *	3,000
3 to < 6 **	7,000
6 to < 8	7,000
8 to < 12	12,000
12 to < 14	10,000
14 to < 18	9,000
18 & Greater	8,000
O-6 & Above	7,000

*** If undergoing internship training.**
**** Not undergoing internship training.**
After Ref: BUMED FY04 Dental Officer Special Pay Plan

2. Additional Special Pay (ASP): ASP is an annually disbursed entitlement. Dental Officers who are entitled for VSP are eligible for ASP as long as they are "not undergoing dental internship, fellowship or initial dental residency training, possess a current, valid, unrestricted license or approved waiver."[29] Additionally, a written agreement to remain on active duty for no less than one year is required.[30] ASP will only be disbursed once the agreement is completed and will begin on the contract's execution date.[31] ASP payments are also adjusted based on the number years of service (Table 3).

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[27] Department of Defense, Financial Management Regulation Military Pay Policy and Procedures – Active Duty and Reserve Pay, DoDFMR 7000-14R, Volume 7A, Chapter 6 (Washington, DC: 2002), 7-8.

[28] David Taylor, Center For Naval Analyses, Comparison of Civilian and Navy Pay for Dentists, CRM 91-20, (Alexandria, Virginia: 1991), 4.

[29] Navy Department, "FY04 Dental Officer Special Pay Plan," Bureau of Medicine and Surgery Special Pay Page, 2003, <https://bumed.med.navy.mil/M1/SpecialPay.htm/> [11 May 2004], 1-2.

[30] Ibid, 1-2.

[31] Department of Defense, Financial Management Regulation Military Pay Policy and Procedures – Active Duty and Reserve Pay, DoDFMR 7000-14R, Volume 7A, Chapter 6 (Washington, DC: 2002), 7-8.

Table 3. Dental Corps Additional Special Pay

Additional Special Pay (ASP)	
Years Serivce	**Special Pay Amount (Dollars)**
<3	4,000
3 to <10	6,000
10 & Greater	15,000

After Ref: BUMED FY04 Dental Officer Special Pay Plan Special Pay Plan

3. Board Certification Pay (BCP): BCP is also an annual entitlement disbursed monthly to eligible active duty Dental Officers. Dental Officers are eligible for BCP if they are entitled to VSP and are Board Certified.[32] Board Certification consists of being "certified by an American Dental Specialty Examining Board recognized by the American Dental Association (ADA) or [being] awarded a Board Certification Equivalency Certificate by the Department of Defense (DoD)."[33] As with other special pays, BCP is based on the number of years of credible service (Table 4).

Table 4. Dental Corps Board Certification Pay

Board Certification Pay (BCP)	
Years Serivce	**Special Pay Amount (Dollars)**
< 10	2,500
10 to < 12	3,500
12 to < 14	4,000
14 to < 18	5,000
18 & Greater	6,000

After Ref: BUMED FY04 Dental Officer Special Pay Plan Special Pay Plan

4. Dental Officer Multiyear Retention Bonus (DOMRB): DOMRB is an annual special pay based on an officer's clinical specialty area and agreement to extend his or her active duty obligated service commitment in the Navy (Table 5).

[32] Department of Defense, Financial Management Regulation Military Pay Policy and Procedures – Active Duty and Reserve Pay, DoDFMR 7000-14R, Volume 7A, Chapter 6 (Washington, DC: 2002), 6.

[33] Ibid, 6.

Table 5. Dental Corps' Dental Officers Multiyear Retention Bonus

Dental Officer Multiyear Retention Bonus (DOMRB) Rates			
Length of Agreement By Specialty	**4-Year Agreement (Dollars)**	**3-Year Agreement (Dollars)**	**2-Year Agreement (Dollars)**
Oral-Maxillofacial Surgeons	20,000	10,000	8,000
Comprehensive/ Operative Dentistry	14,000	10,000	8,000
Endodontics	14,000	10,000	8,000
Orthodontics	14,000	10,000	8,000
Oral Pathology/ Oral Diagnosis/ Oral Medicine	14,000	10,000	8,000
Pediatric Dentistry	14,000	10,000	8,000
Periodontics	14,000	10,000	8,000
Prosthodontics	14,000	10,000	8,000
Public Health Dentistry	14,000	10,000	8,000
Temporomandibular Dysfunction (TMD)	14,000	10,000	8,000
Dental Research	12,000	8,000	6,000
Exodontia (Advanced Clinical Practice - ACP)	12,000	8,000	6,000
Endodontics (ACP)	12,000	8,000	6,000
General Dentistry (ACP)	12,000	8,000	6,000
Periodontics (ACP)	12,000	8,000	6,000
Prosthodontics (ACP)	12,000	8,000	6,000

After Ref: BUMED FY04 Dental Officer Speclal Pay Plan

To be eligible for DOMRB, Dental Officers with a current license with no restriction (unless practicing with a wavier) and below the rank of Rear Admiral (O-7) must "execute a written agreement to remain on active duty"[34] for a period no less than two years to a maximum of four years. Additionally, Dental Officers must have "completed [their] initial residency training"[35] program or have "at least eight years of

[34] Navy Department, "FY04 Dental Officer Special Pay Plan," Bureau of Medicine and Surgery Special Pay Page, 2003, <https://bumed.med.navy.mil/M1/SpecialPay.htm/> [11 May 2004], 2-4.

[35] Ibid, 2-4.

creditable service"[36] or have completed their active duty obligated service commitment as part of their payback for Navy or DoD-funded education and training.[37]

5. Critical Skills Retention Bonus (CSRB): In Fiscal Year 2002, the DoD initiated the CSRB as an incentive to retain military healthcare officers possessing certain identified critical skills undermanned or essential to meeting the Navy's medical mission. Unfortunately, due to funding issues, this initiative was not implemented in FY 02.[38] Dental Officers, who elected to participate in the CSRB in FY03 and executed agreements, did receive the one-time bonus of $10,000.00.[39]

Although Navy Dentists have numerous special pay incentives, the pay gap between military dentists and private-sector dentists continues to increase.[40] Furthermore, with new graduates and new Dental Officers facing larger dental school education debt, these potential career officers "are choosing to work in private practice."[41] Finally, "the December 2000 Journal of the American Dental Association report[ed], that the number of dentists retiring will grow faster than the number of dental school graduates."[42] This trend is expected to continue over the next 20 years. This is expected to lower the future price of dental practices being sold, thus making private practice more affordable and attractive to both current and potential future Navy Dental Officers.[43]

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36 Navy Department, "FY04 Dental Officer Special Pay Plan," Bureau of Medicine and Surgery Special Pay Page, 2003, <https://bumed.med.navy.mil/M1/SpecialPay.htm/> [11 May 2004], 2-4.

37 Ibid, 2-4.

38 Assistant Secretary of Defense, Health Affairs, "Fiscal Year 2003 Dental Officer Special Pay Plan," Bureau of Medicine and Surgery Special Pay Page, 2002, https://bumed.med.navy.mil/bonus/Eligible%20Recipients%20of%20CSRB%20Plan1.pdf./ [11 May 2004].

39. Navy Department, FY-03 Health Professions Critical Skills Retention Bonus (CSRB), NAVADMIN 010/03 (Washington, DC: 2003) <https://www.bupers.navy.mil/navadmin/nav03/nav03010.txt./> [11 May 2004].

40 M. Almendarez, S. Brannman, C. Rattelman, and E. Scherer. (2001). Health Professions' Retention-Accession Incentives Study Reported to Congress (CRM D0003360.A1). Alexandria, Virginia: Center for Naval Analyses, 34-35.

41 Ibid, 34-35.

42 Ibid, 35.

43 Ibid, 35.

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II. DATA COLLECTION AND VARIABLE SELECTION

A. OVERVIEW

Dental Officer retention is a critical issue to the Dental Corps, BUMED and the Navy. Retention is pivotal to fleet readiness through sustained manning levels. By retaining Dental Officers, Dental Corps can fill both operational and non-operational billets worldwide, ensuring the dental health of the fleet. Additionally, although not addressed in this research study, the Dental Corps expends Navy Appropriated funds to send recruits to dental schools and residency training programs. Even though these students are required to serve obligated time in the Navy as payment, the failure to retain these officers past their initial payback period has significant impact on future manning levels for both junior and senior positions, and reduces the ability to provide specialty dental services and decreases the return on the Navy's investment in Dental Officers' educations.

In order for BUMED to track Dental Officers, the Dental Corps developed the BUMED Manpower Information System (BUMIS). This in-house database tracks demographic and service-related information annually on every Dental Officer on active duty. These data are the basis for this study.

This chapter describes the members of the Dental Corps and discusses how variables were selected for a multivariate model to explain and predict Dental Officer retention past the initial obligated service payback period. Finally, all general assumptions used throughout the data gathering and model formulation process are identified.

B. DATA COLLECTION

As stated above, Naval Dental Corps retention data were provided by MED 09 and generated from the BUMIS data collection system. The original data were contained in three Access databases. These databases contained personnel information on all DC officers on active duty from 1984 to the 2003. Recorded information before 1988 was incomplete and therefore eliminated from the analysis. The three databases were queried

together based on social security numbers and record year, and the resulting data file was then exported into Microsoft Excel for preliminary data analysis.

Unfortunately, retention data for each individual were collected annually and recorded as a new record. Each new record was linked to the officer's pre-existing records by his or her social security number. This method of data tracking generated multiple records for each service-member and led to the queried table consisting of more than 31,000 records with over 250 data fields (columns) being tracked for more than 4,400 officers.

1. Data Compilation and Record Selection for Study

The data for this study were derived from the consolidated Excel file containing all BUMIS personnel records. Of the roughly 250 data fields contained in the original very large and complex data files, approximately 40 data fields were retained for the limited scope of this study.

In order to ensure data integrity, each record was reviewed to identify missing data. Records were grouped by officer's social security number and then in ascending order by year. Due to data accuracy and completeness issues for records prior to 1988, only individuals with records starting in or continued through 1994 were retained. Additionally, all officer records initiated in 2000 or later were discarded. Finally, all officers were required to have at least one record at the grade of Lieutenant. Any officer's history beginning after this grade was discarded and was not used in this study. Based on the criteria outlined above, nearly 17,000 records were retained. This accounted for roughly 1,700 active duty, retired or prior service Dental Officers.

2. Sample Selection

Because of the large number of records retained, sampling was used to select individuals for this study. Based on the residency training documented in the BUMIS data fields, the officers within the original population were then divided between officers who received residency training while on active duty and those officers who did not receive Navy-funded residency training. These individuals were assigned to two cohorts (Residency and No Residency). Random samples were drawn from these generated lists. This resulted in two random samples comprised of 100 individuals each.

Once these individuals were identified by cohort, their records were extracted into separate excel files. Each individual's multiple records were condensed into a single record. This required that more than 2,000 multiple records be reduced to 200 comprehensive records. To account for changes over numerous years of service, additional data fields were developed to capture data changes while condensing numerous records into one complete record. These additional data fields accounted for the type and location of tours completed, number of years in the Navy, age upon becoming a Navy dentist, the number of years as a Navy dentist prior to receiving residency training, number of years in the Navy after receiving residency training, number of years in the Navy after completing the initial service obligation period at the time of entering the Navy and after receiving Navy sponsored residency training while on active duty.

3. Independent Variable Selection

Variables for this study were chosen or developed to aid in explaining what contributes to naval Dental Officers staying beyond their obligated service period either at time of commissioning or after receiving residency training. The following independent variables and their expected relationships were chosen:

1. Age When First Paid As A Navy Dentist: This variable was derived by taking the individuals' Profession Pay Date (date first paid as a Navy Dentist) and subtracting his or her date-of-birth.

Question: Does the age at which an officer becomes a naval dentist affect his or her retention beyond initial obligation length of service?

Expectation: Age upon entry is positively related to whether the service member stays beyond his or her initial obligated service period. The basic assumption is that the older an individual is when first paid as a Navy dentist, the more likely he or she is to remain on active duty beyond the obligated service commitment. This is expected to occur because older officer accessions would make a more mature and rational decision to enter military service. Additionally, older individuals may have had more experience in the civilian sector before electing to work in the military. Finally, as age increases, secure employment is tied to increasing family obligations.

2. Ethnicity: This variable reflects each individual's reported ethnic category in accordance with the Bureau of Naval Personnel.[44] In the multivariate model, these codes were combined to create a minority-non minority variable. These combinations will be discussed under the methodology section.

Question: Does ethnicity affect length of service beyond the service member's obligated service requirement?

Expectation: Minority ethnic group membership positively influences the service member to stay beyond the initial obligated service period, due to the perception of greater opportunities for minorities in the military than in the civilian sector.

3. Gain Category: This variable categorizes the commissioning source for each individual in the sample (Table 6). Some categories were combined for use in the multivariate model. These combinations are discussed under the methodology section.

Table 6. Source of Commissioning Program

Gain Category	Source of Entry	Source of Commissioning Program
15	82	Direct Procurement Dental Corps
29	85	Recall to Active Duty
90	90	Health Service Collegiate program
102	89	Dental Student
104	52	Financial Assistance Program
106	88	Armed Forces Health Professions Scholarship Program

After Ref: Manual of Navy Officer Manpower and Personnel Classifications (NAVPERS 15839)

Question: Does gain category affect length of service beyond the service members' obligated service requirement?

Expectation: Officers who receive residency training are anticipated to be more likely to serve past their obligated service period. Officers who enter the service through a DoD-sponsored program are expected to be more likely to seek employment in the civilian sector, because they have little to no educational debt, limited time invested in the Navy for retirement purposes and opportunity for greater financial compensation. Dental Corps Officers who enter through direct procurement are expected to remain in

[44] Navy Department, Manual of Navy Officer Manpower and Personnel Classifications Volume II; The Officer Data Card, NAVPERS 15839I (Washington, DC: 2004).

the service longer due to a conscious decision to enter the Navy after being licensed as a dentist. These individuals are not purely financially focused.

4. Gender: This variable is based on the BUMIS data category SEX. It was converted into binary code values of "0" for males and "1" for females.

Question: Does gender affect length of service beyond the service members obligated service requirement?

Expectation: Women are expected to be less likely then men to serve past both commissioning and residency obligated service requirements. "Female" is expected to have a negative coefficient in the models because of conflicts with family commitments presented by deployments; operational tours may also be more problematic for women than for men.

5. Dental Specialty Code: This variable classifies each Dental Officer's specialty training received on active duty or prior to entry into the Dental Corps (Table 7). Some of these codes were combined in the multivariate model. These combinations are discussed in the methodology section.

Table 7. Dental Corps Subspecialty Codes

DC Code	Specialty
1700	General Dentistry
1710	Endodontics
1725	Comprehensive Dentistry
1730	Maxillofacial Prosthetics
1735	Orthodontics
1740	Operative Dentistry
1745	Oral Medicine & Diagnosis
1750	Oral Surgery
1760	Periodontics
1769	Prosthodontics
1775	Public Health Dentistry
1780	Oral Pathology
1785	Temporomandibular Disorders
1795	Pedodontics

After Ref: Manual of Navy Officer Manpower and Personnel Classifications (NAVPERS 15839)

Question: Does specialty training affect length of service beyond the service members obligated service requirement?

Expectation: Specialty training is expected to significantly influence length of service past both commissioning and residency obligated service requirements because dental specialties with greater demand in the civilian sector will be less likely to remain on active duty beyond their obligated service commitment.

6. CONUS/ OCONUS Tours: These variables identified all tours each individual performed within the continental United States. These tours were classified by geographical location of the command Unit Identification Code (UIC) according to the Navy Comptroller Manual (NAVSO P-1000).[45]

Question: Does location of tours have an effect on the length of service beyond the service members' obligated service requirement?

Expectation: Location is anticipated to significantly influence length of service past both commissioning and residency obligated service requirements. Dental Corps officers who are assigned tours predominantly outside of the continental United States would be more likely to leave active duty at the end of their obligated service period because of family separation and increasing family commitments such as marriage and desire to start a family.

7. Operational Tours: This variable was complied by accounting for all tours according to UIC, which were classified as operational.[46] Operational Tours included any tour attached to one of the three United States Marine Corps' Force Service Support Groups or serving aboard a Navy vessel.

Question: Does Operational Tour assignment have an effect on the length of service beyond the service members' obligated service requirement?

Expectation: Operational Tours, similar to OCONUS tours, are expected to have a negative influence on an individual's length of service. Officers who are assigned to

45 Navy Department, Navy Comptroller Manual; NAVSO P-1000 (Washington, DC: 2004).

46 Ibid.

operational tours are anticipated to be more likely to leave active duty due to time away from family and increasing family commitments such as marriage and desire to start a family.

8. Years Before Residency: This variable measured the time that elapsed between the Dental Officer's report date to the Navy and the date he or she reported to residency training.

Question: Does the number of years before residency have an effect on the length of service beyond the service members obligated service requirement?

Expectation: The wait for residency training is anticipated to have a positive influence on the length of service past the individual's post-obligated service requirements. Officers who receive residency training later in their Navy careers are expected to be more likely to remain on active duty beyond their obligated service requirement as a result of being closer to fulfilling the minimum number of years required to retire.

4. Dependent Variable Selection

To determine whether Dental Officers remained on active duty past their initial or post-residency obligated service requirements, the Final Year of Obligated Service Date was subtracted from the final record year for each individual. If the final record year was the same year or within one year of the Final Year of Obligated Service Date, the individual received a Post-obligation Code of Zero. This means that the Dental Officer resigned from active duty at the end of his or her obligated service commitment. Dental Officers who stayed more than one year after their obligated service commitment ended, received a Post-obligation Code value of One.

The individual's total number of years in the Navy was calculated by subtracting the first year each officer was paid as a naval dentist (Professional Pay Date) from the final record year for each individual. This number represented the number of years the service member spent on active duty. Finally, three was subtracted from this number to determine the number of years that the service member remained on active duty past his or her initial obligated commitment upon being commissioned in the Navy. The individual received a Post-obligation Code of zero if he or she resigned the same year or

within one year of completing obligated service. Dental Officers who stayed two years or more received a Post-obligation Code value of One.

This criterion was similarly applied to officers who received Navy-sponsored residency training. Dental Corps officers who remained on active duty more than one year after completing their obligated service commitment as payback for residency training, received a Post-obligation Code of One. Post-Obligation Code was calculated by determining the number of years spent in residence training and the number of years of obligated service in restitution for accepting residency training. Residency dates were provided in the BUMIS data and the number of years of obligated service was calculated based on the assumption that the service members are required to service on active duty at the ratio of one year for every one-year spent in residency. The Number of Years of Obligated Service was added to the final year of residency to determine the Final Year of Obligated Service Date.

III. DEMOGRAPHICS AND DESCRIPTIVE STATISTICS

A. BACKGROUND

To ensure the study's random samples adequately represented today's Navy Dental Corps population, current population demographic information was obtained from BUMIS. These data, summarized below, provide a baseline reference. Descriptive statistics for the combined Non-Residency and Residency random samples used in this study are compared with the population demographics. Finally, descriptive statistics are provided for each of the two random sample groups.

1. Current Demographics of the Navy Dental Corps

The Dental Corps demographic information was obtained from BUMIS for the second quarter of FY 2003. As stated above, these data are used as a baseline. Today, the Navy Dental Corps is comprised of 1,226 officers. Of these officers, 995 or 91.2 percent are male (Table 8) and roughly 79 percent of all officers are Caucasian as shown in Table 9. Additionally, The rank of Lieutenant makes up the largest segment and accounts for 38.1 percent of all Naval Dental Officers, with Commanders comprising the second largest segment at 22.5 percent (Table 10).

Table 8. Dental Corps Officers by Gender

Male		Female		
Total Males	Percent of Total DC Officers	Total Females	Percent of Total DC Officers	Total DC Officers
995	81.20	231	18.80	1226

Source: BUMIS, Feb 2004

Table 9. Dental Corps Officers by Race/ Ethnic Group

Race	Number	Percent of Total DC Officers
Caucasian	966	78.79
Asian	111	9.05
Hispancic	58	4.73
African Am.	54	4.40
Other	29	2.37
American Indian	8	0.65
Total	1226	100.00

Ref: BUMIS, Feb 2004

Table 10. Dental Corps Officers by Rank

Rank	Number	Percent of Total
Captain	273	21.60
Commander	284	22.50
Lieutenant Cdr.	225	17.80
Lieutenant	482	38.10
Total	1264	100.00

Ref: BUMIS, Feb 2004

B. TOTAL SAMPLE POPULATIONS COMBINED DEMOGRAPHIC INFORMATION

The random sample used to conduct the study was comprised of Dental Officers who served on active duty from 1994 to the 2003 and who entered the Naval Dental Corps prior to calendar year 2000. A total of two hundred officers was randomly selected from the remaining records. As discussed above, one hundred officers were randomly chosen from two excel databases sorted by those officers who received "Residency" training and those who had "No Residency" training. Basic descriptive statistics were constructed for each of these sample populations and for the total sample.

The combined random sample consisted of 19 percent females and closely resembled today's actual Dental Corps population of 18.8 percent female (Table 11).

Table 11. Total Sample by Gender and Residency Training

Total Gender	Residency		Total	Percent of Total by Gender
	No	Yes		
Male	79	83	162	81.0
Female	21	17	38	19.0
Total	100	100	200	100.0

Source: Author

The combined sample rank distribution resembled the Dental Corps composition presented in Table 10 reasonably closely. As expected, Lieutenants make-up the largest portion of the combined sample at 31.5 percent (Table 12).

Table 12. Total Sample by Rank

Rank	Number	Percent of Total
Captain	42	21.0
Commander	51	25.5
Lieutenant Cdr.	44	22.0
Lieutenant	63	31.5
Total	200	100.0

Source: Author

Furthermore, the data were examined comparing officers who received residencies and those who did not receive "Residency" training, by the dependent variable, Post-obligation Code. This dependent variable is defined in Chapter 2. The data revealed that 87 officers or 43.5 percent of the sample entered the Navy Dental Corps as a gain code 15 (direct procurement). Of these 87 officers, 58.6 percent received residency training while in the Navy (Table 13) and 71.3 percent remained on active duty greater than one year after their obligated service commitment (Table 14).

Table 13. Total Sample by Gain Codes and by Residency Participation

	Did Not Receive Residency		Received Residency		Total By	Percent of Total
Gain Code	Number	Percent No Residency	Number	Percent Received	Gain Code	By Gain Code
15	36	41.4	51	58.6	87	43.5
29	5	45.5	6	54.5	11	5.5
90	13	100.0	0	0.0	13	6.5
102	26	43.3	34	56.7	60	30.0
104	0	0.0	1	100.0	1	0.5
106	20	71.4	8	28.6	28	14.0
Total	100	50.0	100	50.0	200	

Source: Author

Table 14. Total Sample by Gain Codes and by Obligation Code

Gain Code	Leavers	Percent Leaver By Gain Code	Stayers	Percent Stayer By Gain Code	Total By Gain Code	Percent of Total By Gain Code
15	25	28.7	62	71.3	87	43.5
29	3	27.3	8	72.7	11	5.5
90	10	76.9	3	23.1	13	6.5
102	19	31.7	41	68.3	60	30.0
104	1	100.0	0	0.0	1	0.5
106	18	64.3	10	35.7	28	14.0
Total	76	38.0	124	62.0	200	100.0

Source: Author

Finally, the largest subspecialty code present in the sample population was 1700 (General Dentistry). Of the 200 Dental Officers in the sample, 79 or 39.5 percent were classified as general dentists. Additionally, these officers accounted for 29 percent of all officers with a Post-obligation Code of One, who remained on active duty greater than one year past their obligated commitment period (Table 15).

Table 15. Total Sample by Specialty Code and by Obligation Code

Specialty Code	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Percent of Total By Specialty
1700	43	54.4	36	45.6	79	39.5
1710	6	37.5	10	62.5	16	8.0
1725	5	13.5	32	86.5	37	18.5
1730	1	100.0	0	0.0	1	0.5
1735	0	0.0	4	100.0	4	2.0
1740	0	0.0	2	100.0	2	1.0
1745	1	33.3	2	66.7	3	1.5
1750	5	29.4	12	70.6	17	8.5
1760	7	38.9	11	61.1	18	9.0
1769	4	33.3	8	66.7	12	6.0
1775	0	0.0	2	100.0	2	1.0
1780	0	0.0	2	100.0	2	1.0
1785	0	0.0	2	100.0	2	1.0
1795	4	80.0	1	20.0	5	2.5
Total	76	38.0	124	62.0	200	100.0

Source: Author

C. SAMPLE DEMOGRAPHIC INFORMATION

As discussed above, the total sample is comprised of two separate groups, officers who did not receive a residency while on active duty, the "Non-Residency" training sample, and officers who attended "Residency" training while on active duty. The descriptive statistics for each of the independent variables is reported by the dependent variable Post-obligation Code to focus on the study's primary research objective, the explanation of Dental Officers retention. The independent variables included are the following: Gender, Commission Source (Gain Code), Subspecialty, Operational Tours (Marine Corps and Shipboard assignment), Outside Continental United States Tours (OCONUS), Age when first paid as a Navy dentist, Number of Years Before Residency and Ethnicity. Due to the small size of some variable categories, many were grouped into new variables for use in the multivariate regression model. Each sample is discussed below.

1. Study Sample "Non-Residency"

As stated above, descriptive statistics were constructed for the independent variables in the "Non-Residency" sample to show the relationship of these characteristics to the dependent variable Post-obligation Code. The findings for each variable are listed below. Some independent variables were grouped to perform multivariate analysis. These new independent variables are also described below.

Gender: The sample "No Residency" consisted of 100 Dental Officers, 79 males and 21 females. Of the sample, 56 officers remained on active duty greater than one year

beyond their obligated service commitment. Female Dental Officers were less likely to stay in the Navy after their obligation was completed (47.6 percent) compared to 58.2 percent of male Dental Officers. (Table 16).

Table 16. Non-Residency Sample Gender By Post-obligation Code

	Post Obligation Code					Percent of
Gender	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
Female	11	52.4	10	47.6	21	100.0
Male	33	41.8	46	58.2	79	100.0
	44		56		100	

Source: Author

Commission Source (Gain Category): The sample consisted of five commissioning sources or Gain Category Codes. The predominant entry source for this sample was Direct Procurement or Direct Accession. Direct Accession accounted for 36 percent of the total commissioning sources and 25 percent of the officers who remained on active duty greater than one year beyond their obligated service commitment (Table 17). Additionally, 80 percent of Dental Officers in this sample who entered the Navy under the AFHPSP left the Navy within one year after the end of their obligated service commitment, while 100 percent of recall officers (29) and 73.1 percent of dental students (102) remained on active duty more than one year past their obligated commitment period.

Table 17. Non-Residency Sample, Commissioning Source by Post-obligation Code

	Post Obligation Code					Percent of
Gain Code	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
15	11	30.6	25	69.4	36	100.0
29	0	0.0	5	100.0	5	100.0
90	10	76.9	3	23.1	13	100.0
102	7	26.9	19	73.1	26	100.0
106	16	80.0	4	20.0	20	100.0
Total	44		56		100	

Source: Author

Commission Source (Gain): To perform logistic regression, the five categories of gain codes were combined to form four independent Gain variables. Of the four new

variables, three were tested in the model and one was used as the base group. The gain codes 29 (Recall) and 90 (HSCP) were combined to form a single category, Gain3 (Table 18).

Table 18. Non-Residency Sample New Gain Codes by Post-obligation Code

New Gain Code	Post Obligation Code					Percent of
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
Gain1	16	80.0	4	20.0	20	100.0
Gain2	7	26.9	19	73.1	26	100.0
Gain3	10	55.6	8	44.4	18	100.0
Gain4	11	30.6	25	69.4	36	100.0
Total	44		56		100	

Source: Author

Gain category Gain1 was the entry source with the highest percentage of leavers (80 percentage) and Gain2 had the lowest percentage of leaves with 26.9 percent.

Subspecialty Code: The sample consisted of six Subspecialty Codes. These codes indicate the subspecialty field in dentistry where each officer has received specialized or advanced training. Additionally, a Subspecialty Code of General Dentist (1700) is provided for officers who have not received advanced training in any specialized field of dentistry. Since Officers in this sample did not attend residency training while in the Navy, 79 percent were classified as General Dentists. Only 46 percent of these general dentist officers remained on active duty greater than one year beyond their obligated service commitment (Table 19). Of the remaining 21 officers in the sample, 95.24 percent of these dentists with subspecialties remained on active duty more than one year beyond their obligated service commitment.

Table 19. Non-Residency Sample Subspecialty Codes by Post-obligation Code

Specialty Code	Post Obligation Code					Percent of
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
1700	43	54.4	36	45.6	79	100.0
1710	0	0.0	3	100.0	3	100.0
1725	0	0.0	9	100.0	9	100.0
1750	1	20.0	4	80.0	5	100.0
1760	0	0.0	3	100.0	3	100.0
1769	0	0.0	1	100.0	1	100.0
	44		56		100	

Source: Author

Subspecialty Code (Spec): To perform logistic regression, the six-subspecialty codes were combined to form two independent Spec variables. Of the two new variables, Spec1 was included in the model and Spec2 was used as the base group. The new variable Spec1 combined these subspecialty codes; 1710 (Endodontics), 1725 (Comprehensive Dentistry), 1750 (Oral Surgery), 1760 (Periodontics) and 1769 (Prosthodontics) together. Additionally, 95.2 percent of the officers in Spec1 remained on active duty beyond their obligation period. Group Spec2 was comprised of subspecialty code 1700 (General Dentistry) (Table 20).

Table 20. Non-Residency Sample Logistical Regression Subspecialty Codes by Post-obligation Code

New Specialty Codes	Post Obligation Code					Percent of
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
Spec1	1	4.8	20	95.2	21	100.0
Spec2	43	54.4	36	45.6	79	100.0
Total	44		56		100	

Source: Author

Operational Tours: This independent variable consists of how many tours each officer in the sample performed either assigned to a Marine unit or aboard a ship as Ship's Company. More than 80 percent of the officers in this sample completed at least one operational tour while on active duty. As Table 21 shows, only 37.5 percent of those officers who performed one operational tour remained on active duty greater than one year beyond their obligated service commitment, where as, 96 percent of the officers in the sample who performed more than one operational tour remained on active duty beyond their obligated service commitment. As a Dental Officer's length of service

increases, he or she would complete more tours of all types. To compensate for this and to focus on the effects of type of tour, a new variable was developed by dividing the variable Operational Tours by Total Tours. This new variable, Operational Tours Adjusted provided the percentage of operational tours out of all tours the Dental Officer has experienced.

Table 21. Non-Residency Sample, Operational Tours by Post-obligation Code

Total	Post Obligation Code					Percent of
Op Tour	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
0	8	44.4	10	55.6	18	100.0
1	35	62.5	21	37.5	56	100.0
2	1	5.0	19	95.0	20	100.0
3	0	0.0	4	100.0	4	100.0
4	0	0.0	1	100.0	1	100.0
5	0	0.0	0	0.0	0	100.0
6	0	0.0	1	100.0	1	100.0
Total	44		56		100	

Source: Author

Operational Tour Adjusted (Optour_Adj): To perform logistic regression the independent variables Operational Tours was divided by Total Tours (sum of Out Side of the Continental United States (OCONUS) and Continental United States (CONUS) Tours) with the result producing the new independent variable Optour_Adj (Table 22).

Table 22. Non-Residency Sample, Operational Tours as a Percentage of Total Tours by Post-obligation Code

Percent	Post Obligation Code					Percent of
Optours_adj	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
0% to 25 %	10	37.0	17	63.0	27	100
25% to 50%	28	46.7	32	53.3	60	100
51% and Greater	6	46.2	7	53.8	13	100
Total	44		56		100	

Mean of Operational Tours as Percent of Total Tours			
Leavers	Stayers	Total	Total Std Deviation
0.4432	0.3156	0.3717	0.2551

Source: Author

OCONUS Tours: Although not used in the study, the number of OCONUS tours was expected to negatively impact a Dental Officers decision to remain on active duty beyond their obligated service commitment. This independent variable consists of how many tours each officer in the sample performed outside of the continental United States.

OCONUS Tours also included serving in Puerto Rico and Hawaii. The data revealed that 43 percent of the officers in the sample had completed or were currently assigned to an OCONUS command with 74 percent of these officers remaining on active duty beyond their obligated service commitment. Additionally, about 42 percent of the officers with no OCONUS tours were "Stayers" (Table 23). This variable not was included in the final model since total tour information was captured in the explanatory variable Operational Tour Adjusted. Removing the variable OCONUS reduced the risk for multicolinearity.

Table 23. Non-Residency Sample Outside of the Continental United States Tours by Post-obligation Code

Total OCONUS Tours	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
0	33	57.9	24	42.1	57	100.0
1	11	28.2	28	71.8	39	100.0
2	0	0.0	4	100.0	4	100.0
Total	44		56		100	

Source: Author

Age When First Paid as a Dentist: This independent variable indicates the age of the officer was when first paid as a Navy dentist. The sample's average age when first paid as a Navy Dentist for all officers was 29.19 years of ages. Not surprisingly, 60 percent of the sample was between 26 and 29 years of age at dental service entry (Table 24).

Table 24. Non-Residency Sample Age At First Pay As A Dental Corps Officer by Post-obligation Code

Post Obligation Code		Total Sample Average
Leavers	Stayers	
28.09	30.29	29.19

Source: Author

The difference in average age at entry between officers who remained on active duty beyond their obligated service commitment (30.29 yrs old) and those who left within one year after the completion of the obligated service commitment (28.09) was 2.2 years. Additionally, females (30.75 yrs old) were slightly older than for male officers (29.33 yrs old) when first paid as a Dental Officer.

Ethnicity: The sample represented 10 categories of ethnicity, including one category for unknown ethnicity. Seventy-five percent of the officers in the sample classified themselves as not belonging to a specific ethnic group.

Ethnic Code (Ethnic): To perform logistic regression, the 10 categories of ethnicity were combined into three independent Ethnic variables. Of the three new variables, two were tested in the model and one was used as the base group. The new variable, Ethnic1, combined ethnicity codes; Hispanic, American/ Canadian Indian, Puerto Rican, Filipino, Indian, Chinese, Japanese and Vietnamese together. Ethnic classification codes Other Ethnicity and Unknown Ethnicity were paired together to form the variable Ethnic2. The last ethnicity classification, None, became Ethnic3. As Table 25 shows, the 75 percent of the individuals in the sample did not classify themselves by ethnicity (Ethnic3). About 52 percent of these officers remained on active duty beyond their obligated service commitment, while the other ethnic categories had a higher percentage of stayers.

Table 25. Non-Residency Sample Logistical Regression Ethic Codes by Post-obligation Code

New Ethnic Code	Post Obligation Code				Total	Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers		
Ethnic1	2	22.2	7	77.8	9	100.0
Ethnic2	6	37.5	10	62.5	16	100.0
Ethnic3	36	48.0	39	52.0	75	100.0
Total	44		56		100	

Source: Author

2. Study's Sample "Residency"

Descriptive statistics were also constructed for the independent variables in the "Residency" sample to show the relationship of these characteristics to the dependent variable Post-obligation Code. The findings for each variable are shown below. Some independent variables were grouped in order to perform logistic regression. Demographics of these new independent variables are also provided below.

Gender: The "Residency" sample consisted of 100 Dental Officers, 83 males and 17 females. Of the sample, 68 officers remained on active duty greater than one year beyond their obligated service commitment. Female Dental Officers were less likely then

male officers to stay on after they completed their obligated service. Only 41.2 percent of female Dental Officers remained on active duty compared to 73.5 percent of male Dental Officers (Table 26).

Table 26. Residency Sample, Gender by Post-obligation Code

	Post Obligation Code					Percent of
Gender	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
Female	10	58.8	7	41.2	17	100.0
Male	22	26.5	61	73.5	83	100.0
Total	32		68		100	

Source: Author

Commission Source (Gain Category): The sample consisted of five commissioning sources. As with the "No Residency" sample, the predominant entry source was Direct Procurement or "Direct Accession." Direct Accession accounted for 51 percent of the total commissioning sources and 72.5 percent of Direct Procurement officers remained on active duty greater than one year beyond their obligated service commitment (Table 27). As seen in the "Non-Residency" sample, Direct Accession (Code 15) was again the largest source of entry for both male and female officers for this sample. Unlike the non-residency sample, 75 percent of the "Residency" officers who entered the Navy DC under the AFHPSP (Code 106) remained on active duty beyond their obligated service period. This is in comparison to only 20 percent of the non-residency sample officers with this gain code.

Table 27. Residency Sample, Commissioning Source by Post-obligation Code

Gain Source	Post Obligation Code					Percent of
Code	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
15	14	27.5	37	72.5	51	100.0
29	3	50.0	3	50.0	6	100.0
102	12	35.3	22	64.7	34	100.0
104	1	100.0	0	0.0	1	100.0
106	2	25.0	6	75.0	8	100.0
Total	32		68		100	

Source: Author

Commission Source (Gain): To perform logistic regression, the five categories of gain codes were combined to form two independent Gaincat variables. One of these new variables was included in the model and one used as the base group. The new variable gaincat1 combined gain codes 29 (Recall), 102 (Dental Student), 104 (Financial

Assistance Program) and 106 (Armed Services Health Professions Scholarship Program). The remaining category, Direct Procurement Dental Corps, was used as the base group. As Table 28 shows, officers who enter the DC through Direct Procurement had a higher percentage of "Stayers" than those entering through other commissioning programs.

Table 28. Residency Sample, New Gain Codes by Post-obligation Code

New Gain Source Codes	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
Gaincat1	18	36.7	31	63.3	49	100.0
Gaincat2	14	27.5	37	72.5	51	100.0
Total	32		68		100	

Source: Author

Subspecialty Code: The sample consisted of 13 Subspecialty Codes. Again, these codes indicate the subspecialty field in dentistry in which each officer has received specialized or advanced training. Since all the officers in this sample have attended residency training while serving on active duty, there was a wide distribution of specialties. The predominant specialty was 1725 (Comprehensive Dentistry), which accounted for 28 percent of the officers' specialties in the sample. About 82 percent of these officers in this subspecialty remained on active duty greater than one year beyond their obligated service commitment (Table 29).

Table 29. Residency Sample, Subspecialty Codes by Post-obligation Code

Specialty Code	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
1710	6	46.2	7	53.8	13	100.0
1725	5	17.9	23	82.1	28	100.0
1730	1	100.0	0	0.0	1	100.0
1735	0	0.0	4	100.0	4	100.0
1740	0	0.0	2	100.0	2	100.0
1745	1	33.3	2	66.7	3	100.0
1750	4	33.3	8	66.7	12	100.0
1760	7	46.7	8	53.3	15	100.0
1769	4	36.4	7	63.6	11	100.0
1775	0	0.0	2	100.0	2	100.0
1780	0	0.0	2	100.0	2	100.0
1785	0	0.0	2	100.0	2	100.0
1795	4	80.0	1	20.0	5	100.0
Total	32		68		100	

Source: Author

New Subspecialty Code (Spec_ad): To perform logistic regression, the 13-subspecialty codes were combined to form four Spec_ad variables. Of the four new variables, three were included in the model and one use used as the base group. The new variables, Spec_ad1, combined subspecialty codes 1745 (Oral Medicine & Diagnosis), 1750 (Oral Surgery) and 1780 (Oral Pathology) together. The second variable, Spec_ad2 combined 1730 (Maxillofacial Prosthetics), 1735 (Orthodontics), 1769 (Prosthodontics), 1775 (Public Health Dentistry), 1785 (Temporomandibular Disorders) and 1795 (Pedodontics). Endodontics (1710) and 1760 (Periodontics) were combined together to form Spec_ad3. The remaining two subspecialties 1725 (Comprehensive Dentistry) and 1740 (Operative Dentistry) were combined to form Spec_ad4 and this was used as the base (Table 30).

Table 30. Residency Sample, New Subspecialty Code by Post-obligation Code

New Spec Code	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
Spec_ad1	5	29.4	12	70.6	17	100.0
Spec_ad2	9	36.0	16	64.0	25	100.0
Spec_ad3	13	46.4	15	53.6	28	100.0
Spec_ad4	5	16.7	25	83.3	30	100.0
	32		68		100	

Source: Author

Spec_ad1 had the highest percentage of officers to remain on active duty more than one year after their obligated service was completed (71 percent). This could be attributed to the number of years these Dental Officers had served prior to residency and that their specialty is more saturated in the civilian market thus making it more appealing to remain in the Navy. The group with the lowest percentage of "Stayers" was Spec_ad3 at 53.6 percent. This group's specialty composition may have more attractive civilian employment opportunities than other specialties.

Operational Tours: This independent variable consists of how many tours each officer in the sample performed either assigned to a Marine unit or aboard a ship as Ship's Company. Eighty five percent of the officers in this sample completed at least one operational tour while on active duty. As Table 31 shows, 35.6 percent of officers who performed two or fewer operational tour elected to leave active duty within one year after

completing their obligated service commitment, while 71 percent of the officers who performed more than one operational tour remained on active duty beyond their obligated service commitment. As stated above in the "Non-Residency" section, Dental Officers who complete more tours of all types would be expected to remain on active duty beyond their obligated service period and have a longer length of service. Again, to compensate for these highly correlated independent or explanatory variables and to focus on the effects of type of tour, the variable Operational Tours Adjusted was used to provide the percentage of operational tours the Dental Officer performed.

Table 31. Residency Sample, Operational Tours by Post-obligation Code

Total	Post Obligation Code					Percent of
Op Tour	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
0	5	33.3	10	66.7	15	100.0
1	15	35.7	27	64.3	42	100.0
2	12	37.5	20	62.5	32	100.0
3	0	0.0	8	100.0	8	100.0
4	0	0.0	2	100.0	2	100.0
5	0	0.0	1	100.0	1	100.0
Total	32		68		100	

Source: Author

Operational Tour Adjusted (Optour_Adj): To perform logistical regression the independent variables, Operational Tours was divided by Total Tours (sum of OCONUS and CONUS Tours) with the product producing the new independent variable Optour_Adj (Table 32). The mean average for officers with a Post-obligation Code One was .316 with a standard deviation of .209.

Table 32. Residency Sample, New Operational Tours Variable (Operational Tours as a Percent of Total Tour) by Post-obligation Code

Operational	Post Obligation Code					Percent of
Optours_Adj	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	Total
0% to 20%	15	28.8	37	71.2	52	100
21% to 40%	13	37.1	22	62.9	35	100
41% and Greater	4	30.8	9	69.2	13	100
Total	32		68		100	

Mean of Operational Tours as Percent of Total Tours			
Leavers	Stayers	Total	Total Std Deviation
0.2502	0.217473	0.2279	0.1545

Source: Author

OCONUS Tours: This independent variable consists of how many tours each officer in the sample performed outside of the continental United States. OCONUS Tours also included Puerto Rico and Hawaii. The data revealed that 60 percent of the officers in this sample completed or are currently assigned to an OCONUS command with 73.3 percent of these officers remaining on active duty beyond their obligated service commitment. Surprisingly, 60 percent of officers with no OCONUS tours were "Stayers" (Table 33). This was significantly higher percentage of "Stayers" than for the "Non-Residency" sample (42 percent).

Table 33. Residency Sample, OCONUS Tours by Post-obligation Code

OCONUS Tours	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
0	16	40.0	24	60.0	40	100.0
1	13	29.5	31	70.5	44	100.0
2	3	23.1	10	76.9	13	100.0
3	0	0.0	1	100.0	1	100.0
4	0	0.0	2	100.0	2	100.0
Total	32		68		100	

Source: Author

Age When First Paid as a Dentist: This independent variable indicates the age of the officer when first paid as a Navy dentist. The average age when first paid as a Navy dentist for all officers in the sample was 28.4 years of ages. Again, it was not surprisingly that 72 percent of the sample was between 26 and 29 years of age when first paid as a Navy dentist (Table 34). There was a small difference in age at entry between officers who remained on active duty beyond their obligated service commitment and those who left within one year after the completion of the obligated service commitment. Officers who remained on active duty had an average age at entry of 28.87 years and a standard deviation of 3.54 years. Officers who left had an average age at entry of 27.91 and a standard deviation of 2.94 years. Additionally, the average age of females (28.47 yrs old) was slightly lower than that of male officers (28.58 yrs old) when first paid as a Dental Officer. Surprisingly, the average age at entry of female officers who received residency training was 1.8 years younger on average than that of females who did not receive residency.

Table 34. Residency Sample, Age At First Pay As Dental Corps Officer by Post-obligation Code

Post Obligation Code		Total Sample Average
Leavers	Stayers	
27.91	28.90	28.41

Source: Author

Ethnicity: Seventy-two percent of the officers in the sample classified themselves as not belonging to a classifiable ethnic group, but only 67 percent of these officers remained on active duty beyond their obligated service commitment as compared to 71 percent for all other ethnic classifications.

New Ethnicity Code (Ethnicnew): In order to perform logistic regression, the original ethnic group information was converted to a binary variable comparing the Non-ethnic with all other ethnic codes in the sample (Table 35). The non-ethnic group was treated as the base. As Table 35 indicates, although the base group (non-ethnic) comprised 72 percent of the sample, only 66.7 percent of those officers were classified as "Stayers" as compared to 71.4 percent of the ethnic group.

Table 35. Residency Sample Population New Ethnic Code By Post-obligation Code

New Ethnic Code	Post Obligation Code				Total	Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers		
Ethnicnew (Base)	24	33.3	48	66.7	72	100.0
Ethnicnew	8	28.6	20	71.4	28	100.0
Total	32		68		100	

Source: Author

Number of Years Before Residency: This independent variable consists of how many years each officer in the sample waited on active duty prior to receiving residency training. Most Naval Dental Officers (77 percent) received residency training between their fifth and eighth year on active duty, with 29 percent of all officers in the sample-beginning residency in their sixth year (Table 36). However, 32.9 percent of Dental Officers who received residency training at their sixth year point, later failed to remain on active duty beyond their obligated service commitment. Surprisingly, although fewer officers receive residency training from the time when they enter into the Dental Corps through their fifth year of service, their propensity to get out of the service was only 3.3

percent lower (29.6 percent). As one would expect, the data reveal an inverse relationship between the number of years before residency and whether a Dental Officer stayed in the Navy.

Table 36. Residency Sample, Number of Years Before Residency Code by Post-obligation Code

# of Yrs Before Residency	Post Obligation Code					Percent of Total
	Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
0	1	100.0	0	0.0	1	100.0
1	1	100.0	0	0.0	1	100.0
3	1	100.0	0	0.0	1	100.0
4	3	42.9	4	57.1	7	100.0
5	2	11.8	15	88.2	17	100.0
6	10	34.5	19	65.5	29	100.0
7	6	30.0	14	70.0	20	100.0
8	4	36.4	7	63.6	11	100.0
9	1	20.0	4	80.0	5	100.0
10	2	40.0	3	60.0	5	100.0
11	0	0.0	2	100.0	2	100.0
12	1	100.0	0	0.0	1	100.0
Total	32		68		100	

Source: Author

Number of Years Before Residency (Years_adj): To perform logistic regression, the Number of Years Before Residency independent variable was converted to three categorical variables (Table 37). Of the three new variables, Years_ad2 was used as the base group due to the larger proportion of officers beginning residency during this time period in their careers. Of the 100 officers in the sample, 60 percent began their residency between their sixth and eighth year as a Navy Dental Officer. Of these 60 officers, only close to 67 percent remained on active duty more than a year beyond their post-obligation period. This was lower than for either of the other two year adjusted groups.

Table 37. Residency Sample, New Number of Years Before Residency Code by Post-obligation Code

Adjusted # of Yrs Before Residency	Time Period	Post Obligation Code					Percent of Total
		Leavers	Percent Leavers	Stayers	Percent Stayers	Total	
Years_adj1	Year 0 to 5	8	29.6	19	70.4	27	100.0
Years_adj2	Year 6 to 8	20	33.3	40	66.7	60	100.0
Years_adj3	Year 9 to 12	4	30.8	9	69.2	13	100.0
Total		32		68		100	

Source: Author

3. Variables Used in Multivariate Model

Table 38 and Table 39 summarize the variables used in the logistic regression models for each sample along with their corresponding means and standard deviations for each sample. Mean values for binary variables indicate the proportion that each group makes up of the total.

Table 38. Non-Residency Sample, List of Variables Used in Multivariate Model

Variables Used	N =	Mean	Std Deviation
Gender	100	0.210	0.409
Age When 1st Paid as a Navy Dentist	100	29.320	4.204
Gain1	100	0.200	0.402
Gain2	100	0.260	0.441
Gain3	100	0.180	0.386
Optours_adj	100	0.372	0.255
Spec1	100	0.210	0.409
Ethnic1	100	0.090	0.288
Ethnic2	100	0.160	0.368
Post Obligation Code	100	0.560	0.499

Table 39. Residency Sample, List of Variables Used in Multivariate Model

Variables Used	N =	Mean	Std Deviation
Gender	100	0.170	0.378
Age When 1st Paid as a Navy Dentist	100	28.560	3.376
Years_adj1	100	0.090	0.288
Years_adj3	100	0.070	0.256
Ethnicnew	100	0.720	0.451
Optours_adj	100	0.228	0.155
Gaincat1	100	0.490	0.502
Spec_ad1	100	0.170	0.378
Spec_ad2	100	0.250	0.435
Spec_ad3	100	0.280	0.451
Post Obligation Code	100	0.680	0.469

IV. METHODOLOGY

A. MODEL FORMULATION

This study uses logistic regression to develop multivariate models to examine the effects of independent variables on the dependent variable Post-obligation Code. The logistic regression model predicts the probability that a Navy Dental Officer will remain on active duty more than one year beyond the initial or post-residency obligation period.

1. Multivariate Models

Logistic regression was used to conduct this study due to its ability to deal with a binary dependent variable and evaluate the relative contribution of each of the independent variables to the "Stay/ Leave" decision. The theoretical models for the two samples developed are provided in Table 40. Post-obligation Code can take on a value of zero (Leaver) or one (Stayer).

Table 40. Multivariate Models for Samples, "Non-Residency" and " Residency"

Logistic Regression Model for Non Residency Navy Dental Officers

Post_obl_code=f (Gender, Age_at_1st_pay_as_dentist, gain1, gain2, gain3, spec1, optours_adj, ethnic1, ethnic2)

Logistic Regression Model for Residency Navy Dental Officers

Post_obl_code=f(gender, Age_at_1st_pay_as_dentist, years_adj1, years_adj3, ethnicnew, optours_adj, gaincat1, spec_ad1, spec_ad2, spec_ad3)

2. Hypothesized Effects of the Explanatory Variables

The independent variables selected for each model were chosen from the available data fields in the original BUMIS database files. Table 41 provides the hypothesized effect that each independent variable will have in comparison to the base case. (See Chap. 2 for a detailed discussion of hypothesized effects.)

Table 41. Non-Residency and Residency Multivariate Model, Hypothesized Effects of Independent Variables

Variable Name	Expected Sign
Non Residency Sample Multivariate Model	
Gender	Neg (-) compared to male base
Age When 1st Paid as a Navy Dentist	Pos (+) relationship as age increases
Gain1	Neg (-) compared to direct procurement base
Gain2	Neg (-) compared to direct procurement base
Gain3	Neg (-) compared to direct procurement base
Spec1	Pos (+) relationship compared to General Dentists
Optours_adj	Neg (-) relationship as number increases
Ethnic1	Pos (+) compared to "Non-Ethnic" base
Ethnic2	Pos (+) compared to "Non-Ethnic" base
Residency Sample Multivariate Model	
Gender	Neg (-) compared to male base
Age When 1st Paid as a Navy Dentist	Pos (+) relationship as age increases
Years_adj1	Neg (-) relationship compared to mid 5 to 8 year recipients
Years_adj3	Pos (+) relationship compared to mid 5 to 8 year recipients
Ethnicnew	Pos (+) compared to "Non-Ethnic" base
Optours_adj	Neg (-) relationship as number increases
Gaincat1	Neg (-) compared to direct procurement base
Spec_ad1	Pos (-) relationship compared to Comprehensive Dentists
Spec_ad2	Pos (-) relationship compared to Comprehensive Dentists
Spec_ad3	Pos (-) relationship compared to Comprehensive Dentists

Source: Author

The variables hypothesized to increase the probability of Dental Officers remaining on active duty greater than one year beyond their initial or post-residency obligated service commitment for the Non-Residency Model are: Age_at_1st_pay_as_dentist (Navy), Spec1, Ethnic1 and Ethnic2.

The variables hypothesized to increase the probability of Dental Officers to remain on active duty greater than one year beyond their initial or post-residency obligated service commitment for the Residency Model are: Age_at_1st_pay_as_dentist (Navy), Years_adj3 and Ethnicnew.

3. Base Cases Used in Each Model

Because logistic regression was chosen as the statistical procedure to test the relationship between the binary dependent variable and the predictor independent variables, it was not possible to use the regression coefficients as direct indicators of partial effects. To determine the partial effect of each independent variable, a base case

or reference individual was developed. Each explanatory variable was varied by one unit and the results predicted probability was compared with the base case predicted probability. Table 42 and Table 43 provide a summary of the base cases used in the Non-Residency and Residency Models.

Table 42. Non-Residency Model Base Case

Independent variable	Base Case Value
Gender	Male
Age When 1st Paid as a Navy Dentist	29.32
Gain Code	Direct Procurement (15)
Optours_adj	.372 Operational Tours
Spec1	General Dentistry (1700)
Ethnic1	None (Y)

Source: Author

Table 43. Residency Model Base Case

Independent Variables	Base Case Values
Gender	Male
Age When 1st Paid as a Navy Dentist	28.56 years of age
Years_adj1	6 to 8 Years
Ethnicnew	None (Y), Not a member of an ethnic group
Optours_adj	.228 Operational Tours
Gaincat1	Direct Procurement (15)
Spec_ad1	Comprehensive (1725) or Operative Dentistry (1740)

Source: Author

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V. DATA ANALYSIS

A. RESULTS: NON-RESIDENCY MODEL

1. Goodness of Fit

a. Global Null Hypothesis Test

The Global Null Hypothesis Test was conducted to for the statistical significance of the model. The test compared the model's intercept against the full model and its corresponding intercept and coefficients, revealing that the Non-Residency model was better than a model with only the intercept (Table 44). The Likelihood Ratio test statistic and its corresponding p-value were statistically significant at the 0.01 level. This indicates that the model is statistically significant.[47]

Table 44. Non-Residency Sample Regression Model: Global Null Hypothesis Test

Model Fit Statistic: Non Residency Model			
	Criterion	**Intercept Only**	**Intercept and Covariates**
	-2 Log L	137.186	93.413
Testing Global Null Hypothesis: Beta = 0			
Test	**Chi-Square**	**DF**	**PR > ChiSq**
Likelihood Ratio	43.7731	9	<.0001

Source: Author

b. R-Squared

Conducting logistic regression on the Non-Residency model produced a pseudo (Cox and Snell's R-Square) R-Squared value of 0.3545 (Table 45). This value is challenging to understand since its highest value, as a rule, is less than one.[48] SAS, the statistical software used to estimate these models, attempts to compensate for this by conducting the Max-rescale R-Square test, a Nagelkerke's R-square test that produces a value ranging from zero to one and is easier to interpret than the R-square value.[49] The

47 "Annotated Output for Proc Logistic," UCLA Academic Technology Services, <http://www.ats.ucla.edu/stat/sas/output/proclog/logistic.htm/> [12 May 2004].

48 "Logistic Regression," North Carolina University; Quantitative Research In Public Administration, <http://www2.chass.ncsu.edu/garson/pa765/logistic.htm/> [3 May 2004].

49 Ibid.

Max-rescale R-square value was 0.475. Both R-square values indicate the model has moderate ability to predict the dependent variable.

Table 45. Non-Residency Sample Regression Model: R-Square and Max-Rescale R-Square

R-Square	Max-rescale R-square
0.3545	0.475

Source: Author

c. Classification Table

A classification table was used to predict the probability for each observation that the individual would elect to remain in the Dental Corps more than one year beyond their obligated service commitment. A classification table "classifies the input binary response observation ["Stayer or Leaver"] according to whether the predicted event[s] probabilities are above or below some predetermined cut-off point."[50] A common cut-off point is at the 0.5 level. In this study, a more appropriate cut-off point was set at the proportion of actual Dental Officers classified as "Stayers" in each sample.[51]

In the Non-Residency sample model, 56 Dental Officers or 56 percent, elected to remain on active duty more than one year beyond their obligated service commitment. Consequently, the cut-off level selected was 0.56. Table 46 shows the model's prediction capabilities at the 0.5 and 0.56 cut-off levels. The classification output reveals that the model has the ability to correctly predict 71 percent of the observation at the 0.56 probability cut-off level. The model demonstrates a modestly higher level of predictability based on the limited sample size and number of predictors.

[50] Selected SAS Documentation: Manpower, Personnel, and Training Analysis, Second Edition (Cary, NC: SAS Institute Inc., 1998), 428.

[51] Ibid, 428.

Table 46. Non-Resident Sample Logistic Regression Model: Classification Table

Non Residency Sample Logistic Regression Model: Classification Table									
	Correct		Incorrect			Percentages			
Prob Level	Event	Non-Event	Event	Non-Event	Correct	Sensi-tivity	Speci-ficity	False POS	False NEG
0.50	45	27	17	11	72.0	80.4	61.4	27.4	28.9
0.56	40	31	13	16	71.0	71.4	70.5	24.5	34.0

Source: Author

2. Non-Residency Sample Logistic Regression: Analysis of Coefficients

The logistic regression results revealed that four explanatory variables were statistically significant, as shown in Table 47. The explanatory variables Gain1 and Spec1 were both statistically significant at the 0.01 level for a one and two-tailed test. Additionally, the explanatory variables Gain3 and Optours_adj were statistically significant at the 0.05 level for a one-tailed test. Table 41 shows the hypothesized sign for each of the statistically significant explanatory variables shown in Table 47.

Table 47. Non-Residency Sample Logistic Regression Variable and Model Results for a One and Two-tailed Test

Parameter	Estimate	Standard Error	Chi-Square	Pr > ChiSq (2-tail Test)	Pr > ChiSq (1-tail Test)
Intercept	-0.2373	2.2945	0.0107	0.9176	0.4588
Gender	-0.1333	0.6415	0.0432	0.8353	0.4177
Age When 1st Paid as a Navy Dentist	0.0493	0.0788	0.3909	0.5318	0.2659
Gain1	-2.1831	0.8111	7.2445	**0.0071**	**0.0036**
Gain2	0.2213	0.6455	0.1175	0.7318	0.3659
Gain3	-1.4500	0.7535	3.7026	**0.0543**	**0.0272**
Spec1	3.2660	1.1609	7.9147	**0.0049**	**0.0025**
Optours_adj	-2.1535	1.0961	3.8603	**0.0494**	**0.0247**
Ethnic1	1.0616	1.0369	1.0481	0.3059	0.1530
Ethnic2	-0.0211	0.7618	0.0008	0.9779	0.4890
Model Fit Test					
Criterion		**Intercept Only**		**Intercept and Covariates**	
-2 Log L		137.186		93.413	
Likelihood Ratio					
Chi-Square		DF		PR > ChiSq	
43.7731		9		<.0001	

Source: Author

3. Non-Residency Sample: Partial Effects for Statistically Significant Variables

Partial effects for the Non-Residency model's significant explanatory variables were then constructed using the base case described in Table 42. The base case individual has a 60 percent probability of remaining on active duty more than one year beyond their obligated service commitment.

Table 48 shows the partial effects for the statistically significant variables used in the Non-Residency logistic model as compared with the base case. By isolating each individual variable and increasing its value by one unit, predicted probability values were obtained and compared with the base case predicted probability. The partial effects table indicates that an individual who enters the Dental Corps through AFHPSP (Gain1) is 45.5 percent less likely to remain on active duty more than one year beyond his or her obligated service commitment as compared to one who entered through direct procurement. Additionally, an officer who entered the Dental Corps through HSCP or who was recalled to active duty (Gain3) is 34 percent less likely to remain on active duty more than one year beyond their obligated service commitment than an officer who entered through direct procurement. The partial effect table also shows that officers who enter the Dental Corps with a subspecialty other than "General Dentistry" are 37.5 percent more likely to remain on active duty greater than one year beyond their obligated service commitment than a general dentist. Finally, increasing the independent variable Optours_adj by 10 percent, thus increasing a dentist's percentage of operational tours by 10 percent, resulted in that Dental Officer being 5.3 percent less like to remain on active duty more than one year beyond his or her obligated service commitment as compared to a dentist with the average percentage of operational tours.

Table 48. Non-Residency Regression Model: Partial Effects Table

Predictor	n=100	Predicted Likelihood of Staying
Base Case		0.60015
		Partial Effect
Gain1		-0.45547
Gain3		-0.33974
Spec1		0.37506
Optours_adj		-0.05261

Source: Author

B. RESULTS: RESIDENCY MODEL

1. Goodness of Fit

a. Global Null Hypothesis Test

Table 49 shows the results of the Global Null Hypothesis Test and Likelihood Ratio test statistic. The Global Null Hypothesis Test revealed that the Residency model was better than a model with only the intercept. Both the Global Null Hypothesis Test and the Likelihood Ratio Test and its corresponding p-value were statistically significant at the 0.01 level for a one-tailed test. This indicates that the model is statistically significant.

Table 49. Residency Sample Regression Model: Global Null Hypothesis Test

Model Fit Statistic: Residency Model			
	Criterion	**Intercept Only**	**Intercept and Covariates**
	-2 Log L	125.374	104.168
Testing Global Null Hypothesis: Beta = 0			
Test	Chi-Square	DF	PR > ChiSq
Likelihood Ratio	21.2062	10	0.0197

Source: Author

b. R-Square

The pseudo R-square and Max-rescale R-square values for the Residency Sample are shown in Table 50. The R-square value of 0.1911 and Max-rescale R-square values of 0.2674 indicates that the model has limited ability to predict the dependent variable.

Table 50. Residency Sample Regression Model: R-Square and Max-Rescale R-Square

R-Square	Max-rescale R-square
0.1911	0.2674

Source: Author

c. Classification Table

In the Residency sample model, 68 Dental Officers or 68 percent, elected to remain on active duty more than one year beyond their obligated service commitment. Again, based on the percentage of officers electing to remain on active duty, the cut-off level selected was 0.68. Table 51 shows the model's prediction capabilities at the 0.5 and 0.68 cut-off levels. The classification output reveals that the model has the ability to correctly predict 61 percent of the observations at the .68 probability cut-off level. The model demonstrates the same level of successful classification at the cut-off level of 0.5. This outcome may reflect the study's limited sample size and limited number of predictors.

Table 51. Resident Sample Logistic Regression Model: Classification Table

Residency sample Logistic Regression Model: Classification Table									
	Correct		Incorrect			Percentages			
Prob Level	Event	Non-Event	Event	Non-Event	Correct	Sensi-tivity	Speci-ficity	False POS	False NEG
0.50	56	5	27	12	61.0	82.4	15.6	32.5	70.6
0.68	43	18	14	25	61.0	63.2	56.3	24.6	58.1

Source: Author

2. Residency Sample Logistic Regression: Analysis of Coefficients

The logistic regression results revealed that five explanatory variables were statistically significant as shown in Table 52. These explanatory variables were Gender, Age_at_1st_pay_as_dentist, Years_adj1, Spec_ad2 and Spec_ad3. The explanatory variables Gender and Spec_ad3 were both statistically significant at the .01 level for a one-tailed test. Additionally, the explanatory variables Age_at_1st_pay_as_dentist, and Spec_ad2 were statistically significant at the 0.05 level for a one-tailed test. The explanatory variable, "Years_adj1," was statistically significant at the .10 level for a one-tailed test. Table 41 shows the hypothesized sign for each of the statistically significant explanatory variables.

Table 52. Residency Sample Logistic Regression Variable and Model Results for a One and Two-tailed Test

Parameter	Estimate	Standard Error	Chi-Square	Pr > ChiSq (2-tail Test)	Pr > ChiSq (1-tail Test)
Intercept	-1.4319	2.6866	0.2277	0.6332	0.3166
Gender	-1.7827	0.6964	6.5542	**0.0105**	**0.00525**
Age When 1st Paid as a Navy Dentist	0.1495	0.0897	2.7796	**0.0955**	**0.04775**
Years_adj1	-1.2999	0.9501	1.872	0.1712	**0.0856**
Years_adj3	-0.2942	0.9793	0.0903	0.7638	0.3819
Ethnicnew	0.1498	0.5693	0.0692	0.7924	0.3962
Optours_adj	-1.3563	1.6043	0.7147	0.3979	0.19895
Gaincat1	-0.5794	0.5075	1.3038	0.2535	0.12675
Spec_ad1	-0.8887	0.8369	1.1275	0.2883	0.14415
Spec_ad2	-1.0711	0.7252	2.1818	0.1397	**0.06985**
Spec_ad3	-1.8241	0.7132	6.5413	**0.0105**	**0.00525**

Model Fit Test		
Criterion	**Intercept Only**	**Intercept and Covariates**
-2 Log L	125.374	104.168
Likelihood Ratio		
Chi-Square	DF	PR > ChiSq
21.2062	10	0.0197

Source: Author

3. Residency Sample: Partial Effects for Statistically Significant Variables

Partial effects for the Residency model's significant explanatory variables were constructed using the base case described in Table 46. The partial effects indicates that the base case individual has a 92.6 percent probability of remaining on active duty greater than one year beyond his or her obligated service commitment.

Table 53 shows the partial effects for the statistically significant variables used in the Residency logistic model as compared to the base case. The probability values were obtained again by isolating each individual variable and increasing its value by one unit as demonstrated earlier with the Non-Residency Model. The partial effects table indicates that a female Dental Corps resident is 24.8 percent less likely to remain on active duty greater than one year beyond her obligated service commitment than a male Dental Officer. Additionally, an officer who enters the Dental Corps one year older than the base case individual is 0.96 percent more likely to remain on active duty more than one year beyond his or her obligated service commitment than one who enters at age 28.56, the average for the sample. The partial effect table also shows that a Dental Corps officer who receives his or her residency within their first five years of service is 15.3 percent less likely to remain on active duty greater than one year beyond the obligated service commitment than a Dental Officer who receives a residency between the sixth and eighth year of service. Finally, a Dental Officer who has a subspecialty in Pedodontics, Temporomandibular Disorders, Orthodontics, Public Health Dentistry, Maxillofacial Prosthetics or Prosthodontics, is 11.5 percent less likely to remain on active duty greater than one year beyond the obligated service commitment than a Dental Officer with a subspecialty in Comprehensive or Operative Dentistry. Additionally, a Periodontics or Endodontics subspecialty dentist is 25.7 percent less likely to remain on active duty more than one year beyond the obligated service commitment than a Dental Officer with a subspecialty in Comprehensive or Operative Dentistry.

Table 53. Residency Regression Model: Partial Effects Table

Predictor	**n=100**	**Predicted Likelihood of Staying**
Base Case		0.92608
		Partial Effect
Gender		-0.24793
Age_at_1st_pay_as_dentist		0.00961
Years1		-0.15259
Spec_ad2		-0.11503
Spec_ad3		-0.25703

Source: Author

VI. CONCLUSIONS AND RECOMMENDATIONS

This study looks at the retention of Naval Dental Officers based on continued service after an individual's required post-obligation service was completed. These individuals are classified as "stayers" or "leavers" on this basis. The primary questions proposed in this research study focus on the factors that influence the retention decisions of junior Dental Officers and Dental Officers who have completed a residency program. Two sample groups were constructed in order to study these issues. The first sample group was selected from Dental Officers who did not receive a Navy-sponsored residency training program and the second sample group was selected from Dental Officers who completed Navy sponsored residency training. Two research models were developed and presented in Chapter IV.

The two models used in the study estimated the probability of a Dental Officer remaining on active duty beyond his or her initial or post-residency service commitment, based selected explanatory variables. The dependent dichotomous variable for both models was the individual's choice to remain on active duty greater than one year beyond his or her obligated service or leave active duty within one year of completing the obligated service commitment. Due to the binary nature of the dependent variable, the data were analyzed using logistic regression. Although the sample size was limited, numerous explanatory variables were shown to be statistically significant in explaining retention beyond obligation.

A. CONCLUSION

1. Statistically Significant Explanatory Variables

For dentists in their initial obligation period, source of commission, dental specialty and proportion of tours that were operational were significant in explaining retention beyond initial obligation. For dentists who had completed a residency program, gender, age when first paid as a Navy Dental Corps Officer, number of years as a Dental Officer prior to beginning residency and dental specialty were significant in explaining retention beyond post-obligation period.

a. Non-Residency Sample

In the Non-Residency Model, officers who entered the DC through the AFHPSP (Gain1) and officers who entered as dental students (Gain2) were shown to be significantly less likely to stay than officers who entered through other accession programs. Additionally, officers with a subspecialty in Endodontics, Comprehensive Dentistry, Oral Surgery, Periodontics and Prosthodontics (Spec1) were significantly more likely to stay than officers entering with other subspecialties. Also, the percentage of tours that were operational was also shown to be statistically significant.

A Dental Officer who enters the Navy Dental Corps through the AFHPSP is 45.5 percent less likely to remain on active duty more than one year past the obligated service commitment compared to a Dental Officer who entered the Navy by direct procurement. Additionally, a Dental Officer who entered the Navy Dental Corps through HSCP or by being recalled to active duty is 34.5 percent less likely to remain on active duty more than one year beyond the obligated service commitment than is a Dental Officer who entered through direct procurement.

Dental specialty (Spec1) also proved to be an important influence on the retention of junior Dental Officers beyond their obligated service commitment. A Dental Officer with a subspecialty other than General Dentistry is 37.5 percent more likely to remain on active duty more than one year beyond the obligated service commitment than a Navy Dental Officer classified as a "General Dentist."

The last significant explanatory variable for the Non-Residency Model was percentage of tours that were operational (Optours_adj). A Dental Officer who had 10 percent more operational tours as a percentage of total tours during his or her obligated service is about 5.3 percent less likely to remain more than one year on active duty beyond the obligated service period than an officer with the average percentage of operational tours for the sample.

b. Residency Sample

The significant explanatory variables for the Residency Model were Gender, Age when first paid as a Navy dentist, Dental Officers who began their residency within the first five years of being a Navy dentist (Years1), Dental Officers with a

subspecialty in Maxillofacial Prosthetics, Orthodontics, Prosthodontics, Public Health Dentistry, Pedodontics and Temporomandibular Disorders (Spec_ad2) or with a subspecialty in Periodontics or Endodontics (Spec_adj3).

Gender proved to be significant in explaining the retention of Navy Dentists who completed a residency program. Female Dental Officers are 24.8 percent less likely to remain on active duty beyond their obligated service commitment than male officers. Additionally, the age when a dentist first receives pay as a Navy Dental Corps Officer was shown to have a significant effect on retention. The older a dentist is when entering the Navy Dental Corps, the more likely he or she is to remain on active duty more than one year after the completion of their obligated service commitment.

The number of years an officer must wait before receiving residency training is also a significant factor in determining whether he or she remains on active duty beyond the obligated service commitment. A Dental Officer who attends residency training before his or her sixth year on active duty is 15.3 percent more likely to leave the Navy within one year after obligated service is completed than an officer attending a residency program later in his or her career. This could be attributed to longer lengths of service placing those who began a residency later closer to retirement eligibility. Finally, Dental Officers with subspecialties other than Comprehensive or Operative Dentistry are less likely to remain on active duty more than one year beyond obligated service commitment. Dental Officers in Maxillofacial Prosthetics, Orthodontics, Prosthodontics, Public Health Dentistry, Temporomandibular Disorders and 1795 Pedodontics (Spec_ad2) and Endodontics and Periodontics (Spec_ad3) are 11.5 and 25.7 percent less likely, respectively, to remain on active duty more than one year beyond obligated service commitment than an officer classified as a "General Dentist."

B. DENTAL CORPS POLICY RECOMMENDATIONS

Based on the findings of this limited study, the following Dental Corps policy recommendations are suggested:

Based on low predicted retention for newly commissioned Dental Officers from accession programs other than direct procurement, the data suggest exploring the

feasibility of recruiting already-licensed dentists to meet the mission of the Navy. Additionally, the findings predict low retention of Dental Officers without subspecialties (General Dentists) and low predicted retention of dentists who receive residency training in subspecialties other than Comprehensive or Operative Dentistry. This suggest that retention might be improved by expanding efforts to recruit currently-licensed dentists with subspecialties other than Comprehensive or Operative Dentistry and by offering more residency programs to Dental Officers in Comprehensive or Operative Dentistry to supplement officer attrition. These dentists should be more mature based on additional years required to attend residency training before entering the Navy and have a higher probability of remaining on active duty beyond their obligated service commitment.

Based on the partial effects findings, Dental Officers who are recruited without a subspecialty should be offered the opportunity for residency training starting in their sixth year of service in the DC. A Dental Corps Officer who begins residency training prior to his or her sixth year of service as a dentist was found to be 15.3 percent less likely to stay more than one year beyond his or her obligated service commitment than a dentist who began a residency either earlier or later in his or her career. Furthermore, the research results suggest that these officers should receive training in Comprehensive or Operative Dentistry when feasible or practical, since residents trained in other subspecialty programs are more likely to leave the Navy at the end of their obligated service commitment.

Finally, when possible, the data suggest new accessions should be limited to non-operational tours and only assigned to operational tours when necessary during their initial obligated service commitment period. These officers need time to adjust to the Navy and the Navy environment before being expected to perform in an operational environment.

C. FURTHER RESEARCH RECOMMENDATIONS

Due to the limited sample size and restricted number of explanatory variables available for use in this study, the following future research recommendations are suggested:

1. Marital and family status should be included in each model. The information should include whether the Dental Officer was married and whether he or she had dependent children at time of accession to active duty, during the obligated service period or during or after attending residency training.

2. Whether the residency training offered by the Navy was provided in a military facility or civilian facility should be included. Although these data were provided in the initial database, the scope and initial expectations prohibited its use in this research project.

3. The number and type of military collateral duties assigned to junior Dental Officers should be included. The effect of additional duties outside of clinical training could be examined to determine administrative and clinical workload for comparison to civilian practitioners.

4. Civilian job market opportunities for dentists by subspecialty would be a potentially useful addition to the model. The last year record for each individual in the sample could be compared to an economic indicator to determine if economic factors are correlated with Dental Officers leaving the Navy.

5. Finally, based on the DC concerns related to manning shortage at the junior and mid-grade officer levels, an extensive retention survey should be undertaken to identify attitudinal factors necessary to predict junior officer retention characteristics.[52]

[52] Jones, Scott M.,<SCMJones@US.MED.NAVY.MIL> "Dental Corps: Forces Structure Statistics Fy03-2nd Quarter [Power Point Attachment]," [E-mail to Alan Christian <abchrist@nps.navy.mil>] 27 April 2004.

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